



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 25

[IB Docket No. 18-86; FCC 18-44]

Streamlining Licensing Procedures for Small Satellites

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: In this document, the Federal Communications Commission proposes to streamline its rules to facilitate the deployment of a class of satellites known as small satellites, which have relatively short duration missions.

DATES: Comments are due on or before **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. Reply comments are due on or before **[INSERT DATE 75 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: You may submit comments, identified by IB Docket No. 18-86, by any of the following methods:

- Federal Communications Commission's Web Site: <http://apps.fcc.gov/ecfs/>. Follow the instructions for submitting comments.
- People with Disabilities: Contact the FCC to request reasonable accommodations (accessible format documents, sign language interpreters, CART, etc.) by e-mail: FCC504@fcc.gov or phone: 202-418-0530 or TTY: 202-418-0432.

For detailed instructions for submitting comments and additional information on the rulemaking process, see the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: Merissa Velez, 202-418-0751.

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Notice of Proposed Rulemaking (NPRM), IB Docket No. 18-86; FCC 18-44, adopted and released on April 17, 2018. The full text of this document is available at https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0417/FCC-18-44A1.pdf. The full text of this document is also available for inspection and copying during business hours in the FCC Reference Information Center, Portals II, 445 12th Street SW., Room CY-A257, Washington, DC 20554. To request materials in accessible formats for people with disabilities, send an email to FCC504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

Comment Filing Requirements

Pursuant to §§ 1.415 and 1.419 of the Commission's rules, 47 CFR 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). See Electronic Filing of Documents in Rulemaking Proceedings, 63 FR 24121 (1998).

- Electronic Filers. Comments may be filed electronically using the Internet by accessing the ECFS, <http://apps.fcc.gov/ecfs>.
- Paper Filers. Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number. Filings may be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must

be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th Street, SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

People with Disabilities. To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

Ex Parte Presentations

Pursuant to 47 CFR 1.1200(a), this proceeding will be treated as a "permit-but-disclose" proceeding in accordance with the Commission's ex parte rules. Persons making ex parte presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral ex parte presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the ex parte presentation was made, and (2)

summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter's written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during ex parte meetings are deemed to be written ex parte presentations and must be filed consistent with 47 CFR 1.1206(b). In proceedings governed by 47 CFR 1.49(f) or for which the Commission has made available a method of electronic filing, written ex parte presentations and memoranda summarizing oral ex parte presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's ex parte rules.

Paperwork Reduction Act

This document contains proposed new and modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

Synopsis

In this Notice of Proposed Rulemaking (NPRM), we seek comment on proposed revisions to our rules to facilitate deployment of a class of satellites known colloquially as “small satellites.” These types of satellites, which have relatively short duration missions, have been advancing scientific research and are increasingly being used for commercial endeavors such as gathering Earth observation data. The proposed rules are designed to lower the regulatory burden involved in licensing small satellites and reduce application processing times, while offering protection for critical communication links and enabling efficient use of spectrum for this dynamic sector.

BACKGROUND

The impetus for this NPRM is to facilitate the authorization and operations of “small satellites.” Although a wide variety of satellites are being designed and launched as “small satellites,” the Commission has not previously defined this category of space objects. There are a number of ways of describing small satellites. A recent International Telecommunication Union Radiocommunication (ITU-R) Report indicated that satellites weighing less than 500 kilograms (kg) are sometimes referred to as small satellites.¹ The National Aeronautics and Space Administration (NASA) has in some instances described small satellites as satellites having a mass of less than 180 kg.² The ITU-R Report focused on satellites that have a mass of less than 10 kg and identified their typical mission duration as less than three years. Such

¹ See International Telecommunication Union, Radiocommunication Sector (ITU-R), Characteristics, definitions and spectrum requirements of nanosatellites and picosatellites, as well as systems composed of such satellites, Report SA.2312 (Sept. 2014), <https://www.itu.int/en/ITU-R/space/Documents/R-REP-SA.2312-2014-PDF-E.pdf> (ITU-R Characteristics Report). The ITU-R Report focused on a subset of satellites that have been characterized as “nanosatellites” and “picosatellites.” *Id.* at 2. Nanosatellites typically have a mass of 1-10 kg, and picosatellites typically have a mass of 0.1-1 kg. *Id.* at 3. The ITU-R Report focused on a subset of satellites that have been characterized as “nanosatellites” and “picosatellites.” Nanosatellites typically have a mass of 1-10 kg, and picosatellites typically have a mass of 0.1-1 kg.

² See, e.g., NASA Ames Research Center, Small Spacecraft Technology State of the Art, NASA/TP-2015-216648/REV1 at 1 (Dec. 2015), https://www.nasa.gov/sites/default/files/atoms/files/small_spacecraft_technology_state_of_the_art_2015_tagged.pdf (NASA Small Spacecraft Technology Report) (describing small satellites as spacecraft with a mass of less than 180 kg for purposes of the Report).

missions have been characterized in other ITU-R documents as “short duration missions.”³

Other notable typical characteristics of small satellites include operation in low-Earth orbit (LEO), as well as lower power as compared with traditional satellite systems. This proceeding seeks to address this category of “small satellites” which we propose to define by seeking comment on a number of particular characteristics.

The Commission has authorized small satellites both as commercial operations under part 25 of the Commission’s rules and as experimental operations — including scientific and research missions for purposes of experimentation, product development, and market trials — under part 5 of the Commission’s rules. Some amateur small satellite operations have also been authorized under part 97 of the Commission’s rules. Because of the increasingly commercial nature of small satellite missions, many satellites are not suitable for licensing under the Commission’s part 5 experimental licensing process, and part 5 licensees cannot obtain interference protection for radiocommunications links. On the other hand, obtaining a part 25 regular commercial authorization for an NGSO system can be challenging for some small satellite applicants because of the costs and timelines involved, as compared to the overall scope of most small satellite enterprises. The same application and regulatory fees are currently applicable to all NGSO part 25 applicants and licensees, regardless of the specific characteristics of the system. In some instances, these fees constitute a large percentage of the cost of the small satellite system, and could even exceed the total cost of a small satellite mission. Part 25 licensees are also subject to a requirement to post an initial surety bond, which can be challenging for licensees planning small, low-cost systems. Further, under part 25, most NGSO satellite applications are processed according to a processing round procedure, which can add to application review time by the

³ ITU-R Resolution 659 (WRC-15), Studies to accommodate requirements in the space operation service for non-geostationary satellites with short duration missions (defining “short duration mission” as typically not lasting more than three years).

Commission and regulatory complexity for applicants. Given some of the challenges presented by the Commission’s licensing process to small satellite systems and their promise as a driver of innovation, our goal in this proceeding is to develop a streamlined authorization process within part 25 that is tailored to small satellites.

Today the small satellite sector is engaged in a range of activities, from brief research-oriented satellite missions to regularly replenishing commercial satellite constellations operating over a number of years.⁴ While this NPRM is focused on those missions having short duration, we observe that there appears to have been growth in this sector across the full range of activities. For purposes of this rulemaking we are not proposing to consider non-geostationary orbit (NGSO) FSS constellations that include numerous satellites to be “small satellites,” even if the physical size of each of those satellites could be considered small.⁵ We believe that the characteristics proposed below for small satellites applying under the streamlined process, such as an orbital lifetime of five years or less and the ability to share spectrum with existing and future operators in a particular frequency band, will differentiate small satellite systems under consideration in this NPRM from typical NGSO FSS, MSS, or other systems requiring full-time uninterrupted availability of assigned spectrum. We recognize that NGSO FSS systems may in part be responsible for some growth indicators discussed below, such as launch vehicle development, but to the extent possible we have sought to exclude those systems from our discussion of trends in this sector.

⁴ These replenishing satellite systems consist of satellites that are replaced on a regular basis, as the service continues to be provided. An example of a system in this category is Planet’s NGSO system.

⁵ For example, some of the planned NGSO FSS systems consist of what could be considered “minisatellites”, with a typical mass between 100 kg and 500 kg. This proceeding is also not tailored to address the operations of traditional NGSO satellite constellations offering mobile-satellite service (MSS), such as those operated by Iridium LLC, Globalstar, Inc., or ORBCOMM License Corp., more traditional NGSO satellites offering remote sensing operations, or those in the Satellite Digital Audio Radio Service (SDARS), among others.

For much of the history of the satellite industry, economies of scale, increased capabilities of launch vehicles, and rising global demand for satellite services pushed satellite manufacturers to focus their efforts on designing larger and more powerful satellites. In the last 15 years, however, the miniaturization of components and the ability of small satellite developers to capitalize on commercial off-the-shelf equipment has enabled smaller, cheaper satellites to be built and launched into space. In 1999, engineers at California Polytechnic State University and Stanford University developed a small satellite standard known as the “CubeSat” design, with the goal to train students and expose them to real-world engineering practices and design. The CubeSat is a standardized interface consisting of an approximately 10 cm x 10 cm x 10 cm unit or “U” that can be scaled up to create CubeSats that are 3U (three units) or 12U (12 units) in size, for example. The standardized specification enables CubeSats to be fully enclosed in specially developed deployment mechanisms that can be added to launch vehicles as secondary payloads. The CubeSat specification has been widely adopted even outside the academic community, largely due to low costs and access to launch services, and satellites based on the standard constitute a large percentage of small satellites deployed in recent years. While the advantages of small satellites have ensured their continuing use by universities and research institutions, it has also encouraged the growing number of CubeSat missions that are commercial.

Commercial sector involvement in all small satellites, not just CubeSats, has increased significantly in recent years. Venture capital firms are investing in small satellite companies, such as those providing Earth imagery. According to one report, the use of small satellites for commercial purposes represents a shift from the practice before 2013, when the majority of small satellites were used for government and academic operations.

The United States continues to be the leader in the number of small satellites launched, and in the last several years the Commission has licensed several commercial earth exploration satellite service (EESS)⁶ constellations that operate using small satellites based on the CubeSat concept.⁷ These constellations, consisting of a large number of rapidly-replenishing satellites, have been licensed under part 25 of the Commission's rules. The Commission has also fielded an increasing number of applications from small satellite proponents seeking authorization under the experimental licensing process under part 5 of the Commission's rules.⁸ Particularly since 2013, the Commission has seen a marked increase in the number of unique small satellite systems seeking to be licensed. Many of these applications are still from universities or other research-oriented organizations with intended short duration missions, but a growing number of others are applications from commercial entities that may plan to transition to licensing under part 25 of the Commission's rules after completing a technology testing and demonstration phase.⁹

The Commission currently authorizes small satellites in three ways: (1) as commercial satellite operations under part 25 of the Commission's rules, (2) as experimental operations

⁶ The EESS is a radiocommunication service between earth stations and one or more space stations, which may include links between space stations, in which: (1) information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment, is obtained from active sensors or passive sensors on Earth satellites; (2) similar information is collected from airborne or Earth-based platforms; (3) such information may be distributed to earth stations in the system concerned; and (4) platform interrogation may be included. This service may include feeder links necessary for its operation. 47 CFR § 2.1; ITU R.R. 1.51.

⁷ Operators in this category include the NGSO constellations of Planet, Spire Global, Inc. (Spire), and Terra Bella Technologies, Inc. (Terra Bella) (formerly known as Skybox Imaging, Inc.).

⁸ Proponents of more than 200 unique systems consisting of one or more satellites have applied for a license through the experimental licensing process since 2009. In 2013, recognizing the increasing number and variety of organizations seeking to participate in the launching of satellites, the Commission issued a public notice with guidance on obtaining licenses for small satellites, including small satellites seeking experimental licenses.

⁹ Planet and Spire are two examples of small satellite ventures that have been transitioned from the experimental testing phase to commercial operations.

under part 5 of the Commission's rules, and (3) as amateur service satellite operations under part 97 of the Commission's rules.

The Commission has licensed under the part 25 rules several NGSO constellations utilizing smaller satellites based on the CubeSat concept. While some waivers have been requested in these applications, many of the Commission's existing NGSO rules have been readily applicable to these types of systems. However, the types of NGSO constellations that have been licensed under part 25 that use smaller-sized satellites are often large commercial constellations, in some cases envisioned to include hundreds of small satellites deployed more or less continuously over an extended period. The same procedures may not be suitable for an operator launching fewer small satellites with an intended short duration mission, because of fees and those costs associated with posting a surety bond, as well as the extended timelines associated with a Commission processing round. A processing round may not be necessary for systems that do not require constant spectrum availability, since sharing may be more easily attainable with future systems seeking to use the same spectrum. Some of these factors specific to the application process in part 25 may explain why the number of part 25 licenses has not increased appreciably in recent years while the number of individual small satellites licensed by the Commission, particularly through experimental licenses, has increased.¹⁰ Additionally, some applicants have filed for licensing under the experimental licensing process and then later transitioned to part 25 commercial operations, rather than initially filing for a part 25 license. These factors suggest that some applicants could benefit from an authorization process for regular (rather than experimental) operations that utilizes a process different from the Commission's existing part 25 NGSO authorization process. Accordingly, in Section III of this

¹⁰ As noted *supra*, between 2009 and 2018, proponents of more than 200 unique systems consisting of one or more satellites have applied for an experimental license. Of these proposed systems, approximately 120 have been licensed.

NPRM, we propose a new approach to licensing small satellites that differs from our existing part 25 process. If adopted, this new approach could enable small satellite operators to obtain licenses for regular operation under a set of rules to be included in part 25, but through a process better suited to the shorter duration of small satellite operations.

To date, the majority of non-governmental small satellite operations in the United States have been authorized through the experimental process under part 5 of the Commission's rules on a non-interference, unprotected basis and with limited license terms. Non-interference, unprotected operations may be acceptable for some satellite operations, but for other types of operations, and particularly for satellite mission critical functions such as telemetry, tracking, and command (TT&C), it can be important that satellite links have some level of interference protection.

A variety of frequency bands have been used for, or requested for use by, the types of operations frequently thought of as "small satellite" operations,¹¹ both on a conforming and non-conforming basis with respect to the allocations in the United States Table of Frequency Allocations (U.S. Table). Frequency bands sought for use by small satellite operators for downlinks or uplinks¹² have included: 137-138 MHz, 144-146 MHz, 148-150.05 MHz, 399.9-400.05 MHz, 401-403 MHz, 435-438 MHz, 449.75-450.25 MHz, 460-470 MHz, 902-928 MHz, 2020-2025 MHz, 2025-2110 MHz, 2390-2400 MHz, 2400-2450 MHz, 5830-5850 MHz, 8025-8400 MHz, and 25.5-27 GHz. The majority of these bands have been authorized by the Commission for one or more small satellite(s) or systems, either on an experimental basis under part 5 or under part 25 of the Commission's rules. These authorizations have generally been for

¹¹ As noted supra, we do not consider large NGSO constellations providing FSS to be "small satellites" for purposes of this NPRM.

¹² As discussed in more detail infra, small satellite operators have also sought to communicate via inter-satellite links with the Globalstar and Iridium systems in bands allocated to the MSS.

short duration missions and episodic uses, such that actual use of any of these bands by small satellites in any given area has been limited to a relatively small percentage of time. In some instances, use of these frequency bands has been subject to coordination with Federal users through the U.S. Department of Commerce’s National Telecommunications and Information Administration (NTIA) inter-agency coordination process.

Streamlined Process for Small Satellites

The Commission has found that many small satellites are launched not as part of large constellations, but as part of small-scale operations consisting of a single satellite or only a few satellites. As noted, existing part 25 rules governing NGSO-like¹³ systems are not necessarily tailored to address such small-scale operations and may present challenges for small satellite applicants and licensees. We propose to establish a set of streamlined application and processing rules for commercial NGSO small satellites meeting certain criteria. As described below, it appears that satellites with the characteristics outlined in this NPRM could be authorized on a more streamlined basis, both from a radiofrequency (RF) interference and orbital debris mitigation perspective, than satellites that we have typically licensed under the existing part 25 rules. Accordingly, we propose an approach for authorizing this new category of satellites that we believe will make the process more accessible, decrease processing time for applications, limit regulatory burdens borne by applicants, and offer protection for critical communication links, while promoting orbital debris mitigation and efficient use of spectrum. Our objective is to develop an alternative arrangement for authorizing small satellites that is more efficient for both applicants and the Commission and that better reflects the unique nature of small satellite deployment than the existing authorization regimes.

¹³ “NGSO-like” is term used in the Commission’s rules to describe systems which are either (1) NGSO satellite systems or (2) GSO mobile satellite service (MSS) satellite systems that communicate with earth stations using non-directional antennas.

A primary goal of this proceeding is to better tailor the Commission’s regulatory process to small satellites. Currently, an application for an NGSO satellite system under part 25 of the Commission’s rules requires the applicant to submit an FCC Form 312, Main Form and Schedule S, along with exhibits as described in section 25.114 of the Commission’s rules.¹⁴ NGSO systems are also subject to frequency-band and service-specific requirements. NGSO satellite applications are processed according to a processing round procedure. NGSO satellites that complete the processing round procedure are subject to certain milestones for completing system deployment, and a bond requirement, as well as operational requirements that may be frequency-band or service-specific. Under the proposed streamlined small satellite process, applicants would not be subject to processing round procedures, although certain other requirements would continue to apply, as described below. Ideally, this new process would decrease the time spent by some NGSO applicants in submitting applications, as well as Commission staff time in processing applications, commensurate with the short mission lifetimes of many small satellites. While this proposed process would still include several of the requirements in section 25.114 of the Commission’s rules, we envision that the small satellite process will be set forth in its own section of part 25 to enable small satellite applicants seeking to use this process to clearly understand the applicable procedures and technical requirements.

Under our existing rules, entities may file a petition for a declaratory ruling to access the U.S. market using a non-U.S.-licensed space station. Although we at some points use the term “license” in this NPRM, we anticipate that the same basic processes for obtaining authorization for small satellite operations will also be available to proponents of foreign-licensed satellites seeking U.S. market access via declaratory ruling. Accordingly, we do not propose rule changes

¹⁴ This includes information regarding the applicant’s orbital debris mitigation plan.

that would limit the streamlined process to applicants seeking a U.S. license. We seek comment on this approach.

Characteristics. We propose a series of criteria that would define the types of operations able to qualify for the small satellite process. These criteria are consistent with the goals of enabling faster review of applications by the Commission in order to facilitate the deployment and operation of small satellites that can advance research missions and support services such as the provision of Earth observation data. Under these criteria, many satellites that are currently licensed through the experimental licensing process under part 5 of the Commission's rules would likely qualify as small satellites and therefore could be subject to the part 25 streamlined process proposals.

We also seek comment on whether there are other criteria not considered below that should be met by satellites applying under this streamlined process. Many proposals in this NPRM rely on the Commission's current understanding of the characteristics and scope of operations that generally define small satellites; for example, that a small satellite is typically designed to serve its purpose within a limited, relatively short period of time, and that these satellites have more limited frequency use characteristics than more traditional operations licensed under part 25, including use of narrower bandwidths and ability to share and not preclude other operations in a particular frequency band. Are these assumptions about the nature of small satellites—and any others reflected in this NPRM—accurate? Are there any other defining traits of small satellites that we may have overlooked and should be taken into account as we define eligibility for the proposed streamlined process?

Number of Spacecraft. We propose to limit the number of spacecraft that can be deployed under a part 25 small satellite license. We propose to license no more than ten

satellites under a single small satellite license and seek comment on this approach. This is generally consistent with our experience authorizing small satellites. We anticipate that many small satellite applicants intend only to launch one or a few satellites in total, and this proposal would enable those applicants to proceed in a streamlined manner. We seek comment on this approach and on whether we should consider other factors in determining the number of total satellites that may be specified in any single license under the streamlined process. We note that our proposed process is intended for a limited group of applicants whose operations are small enough in scope that it would not serve the public interest to apply certain of our standard part 25 procedures. We seek comment on what rules would be necessary to facilitate that goal, including whether it is necessary to adopt limits on the number of applications that can be filed under the proposed streamlined process by an individual small satellite operator or its affiliates.

Planned On-Orbit Lifetime. For an applicant seeking a license under the streamlined small satellite process, we propose that the applicant must certify that the total on-orbit lifetime is planned to be five years or less, including the time it takes for the satellite(s) to deorbit. The ITU has found that for nanosatellites, such as CubeSats, the typical operational lifetime is between one and three years, although operational lifetimes of five, six, or even ten years are possible for some small satellites. The ITU also recently identified three years to be typically the upper limit for what it considers to be “short duration missions.” Factoring in time for the satellites to deorbit,¹⁵ and that there may be satellites launched at different times under a license, we seek comment on whether five years is an appropriate total on-orbit lifetime for small satellites that would be eligible for the streamlined process. The five-year planned lifetime

¹⁵ Many small satellites are deployed in LEO, where they are more susceptible to upper atmospheric perturbations, solar winds, and other factors which can impact the orbit of the satellite and affect the duration of its operations. See NOAA Space Weather Prediction Center, Geomagnetic Storms, <http://www.swpc.noaa.gov/phenomena/geomagnetic-storms>.

corresponds to satellite orbits at relatively low altitudes, consistent with other proposals in this NPRM. For example, all satellites lacking propulsion that are deployed at or below an altitude of 400 km will naturally de-orbit by atmospheric re-entry within five years. Should a small satellite that is not designed with a sufficiently short orbital lifespan to result in atmospheric re-entry within five years nevertheless be eligible if it has a capability to maneuver to a lower orbit that would ensure re-entry within five years? Applicants seeking to operate a small satellite for longer than five years would not be eligible for the streamlined process and could seek a license or market access grant under our existing part 25 NGSO procedures, which provide for longer license terms.¹⁶ We seek comment on this proposal and any other factors to consider in identifying eligible satellites based on orbital lifetime.

License Term. We propose that the license term for these satellites be five years and that the license term for the satellites covered by each small satellite license would begin once one satellite has been placed into its authorized orbit. We anticipate that most operators would launch and operate all satellites in these small constellations within a short period of time, therefore it would be appropriate to begin the license term once the first satellite has been placed into its authorized orbit. We seek comment on this proposed five-year license term and whether there are other approaches that we should consider in determining what constitutes an appropriate license term, such as limiting license terms to be proportional to the expected satellite operational lifetime. We also ask alternatively whether the license term should begin at the time of grant, given the typically shorter timeline from satellite development to launch for small satellites.

¹⁶ With some exceptions, licenses issued under part 25 of the Commission's rules are currently issued for a period of 15 years, although the Commission reserves the right to grant or renew station licensees for less than 15 years.

Given the possibility of seeking additional licenses under the streamlined process, it does not appear necessary or efficient to adopt rules for replacement satellites or expectation of replacement,¹⁷ or to provide for license extensions.¹⁸ Accordingly, we propose that licenses granted under the streamlined process will be valid only for the original satellite(s) launched and operated by the licensee.¹⁹ We believe that this approach is consistent with the typical technical capabilities of small satellites, which often last no more than a few years in orbit, and also reflects the limited scope of the small satellite process. The possibility of seeking additional licenses as new satellites are launched provides a mechanism to address rapid turnover in deployment and technology. We seek comment on this approach toward license extensions and replacement spacecraft.

We also recognize the possibility of commercial lunar missions or other non-Earth-orbiting missions in the future utilizing CubeSats or other small satellite designs.²⁰ We seek comment on whether the small satellite process proposed here should be available to such missions and, if so, whether certain prerequisites for the small satellite process should apply only to Earth-orbiting satellites. For example, we seek comment on whether applicants for satellites not intended to orbit the Earth could calculate anticipated mission lifetime based on anticipated operational lifetime rather than total on-orbit lifetime, and whether a different license term should be applicable to such missions. We also anticipate that the proposed certification regarding disposal of the satellite through atmospheric re-entry would need to be modified for

¹⁷ Part 25 of the Commission's rules currently provides for space station system replacement authorizations for non-geostationary orbit satellites.

¹⁸ Part 25 of the Commission's rules generally permit licensees to file for license extensions for space stations as license modifications, subject to the requirements of section 25.117.

¹⁹ Additionally, we do not anticipate that in-orbit spares would be authorized under a small satellite license.

²⁰ Development of these types of small satellite missions for non-commercial, scientific purposes has been ongoing.

non-Earth-orbiting satellites, as well as the certification regarding deployment orbit. We seek comment.

Maximum Spacecraft Size. We tentatively conclude that satellite size, defined either by mass or by volume, should be a criterion for qualifying small satellites for streamlined processing.²¹ We recognize that there are a great variety of technologies and designs used for small satellites and seek comment on what the maximum size for small satellites should be, particularly to avoid situations where systems of satellites that would be more appropriately licensed under the standard part 25 procedures seek to gain some advantage by applying through the small satellite streamlined process described below. We propose a maximum mass of 180 kg for any satellite that would be authorized under the streamlined process. NASA has used a maximum mass of 180 kg as one demarcation for the category of small satellites, which can encompass a variety of spacecraft, and we believe this upper mass should be sufficient to include typical small satellite designs, given the types of applications we have received to date, while allowing for flexibility to accommodate evolving satellite designs. In addition, we anticipate that this maximum mass would preclude systems that are not small satellites from applying under this streamlined process. We seek comment on this proposed limit. Would a greater maximum mass (e.g., 500 kg) or a smaller maximum mass be appropriate for characterizing small satellites? Do other proposed criteria, such as the proposed zero reentry casualty risk criteria discussed below, effectively preclude larger satellites?

Deployment Orbit and Maneuverability. We propose to require that applicants filing under the new proposed process certify that their proposed satellite will comply with one of several options regarding the deployment orbit and/or maneuverability of the satellite. First, if

²¹ We also propose to specify a minimum size for satellites authorized under this streamlined process, as discussed *infra*. The proposal specifying a minimum size is relevant to trackability of the satellites, and so is discussed in that context.

the applicant intends to deploy the satellite(s) at an orbit below the orbit of the International Space Station (ISS), which is at an altitude of approximately 400 km, the applicant would certify that its satellite will be deployed at that lower-orbit location. Second, if the applicant intends that its satellite(s) will be deployed from the ISS itself, or from a vehicle while that vehicle is docked with the ISS, the applicant would certify that its satellite will be deployed in this manner.²²

Although the ISS is currently the only continuously occupied manned spacecraft in LEO, we recognize that China currently operates a spacecraft in LEO below the ISS that is periodically manned, and that other long-term manned spacecraft have been considered for operation in LEO as well. In the event that any such manned spacecraft are located at altitudes below where an applicant intends to operate a small satellite, we propose that the applicant must describe in narrative form the design and operational strategies it will use to avoid collision with manned spacecraft.²³ Such strategies could include use of propulsion, reliance on orbits not occupied by manned spacecraft, coordination efforts with manned spacecraft, or other reasonable means of avoiding collision. We seek comment on these proposals.

Deployment of satellites lacking maneuvering capabilities above the ISS, to orbits from which they will eventually transit through the ISS altitude band, increase the likelihood that the ISS will need to conduct avoidance maneuvers, potentially disrupting ISS operations. For that reason, deployment of satellites without propulsion capabilities above the ISS may not be appropriate for streamlined consideration. We propose as a third option, however, to authorize small satellites under the streamlined process to deploy at altitudes above the ISS if they certify that the satellite(s) have sufficient propulsion capabilities to perform collision avoidance

²² Such spacecraft have similarly shorter orbital lifetimes.

²³ An *ex parte* filing recommended that we consider future manned spacecraft and their likely orbits, and require that satellites have a maneuvering capability that is tested and demonstrated. *See* Alistair Funge, *ex parte* filing, IB Docket No. 18-86 (filed Apr. 3, 2018).

maneuvers and deorbit within the license term proposed above. While many small satellites to date have not been equipped with onboard propulsion systems, new technologies are being developed that could provide a means for actively maneuvering.²⁴ We tentatively conclude that more limited maneuvering capabilities, such as those relying primarily on drag, would be insufficient to support deployment at higher altitudes under the streamlined small satellite process, as these methods will likely require closer Commission review, and seek comment on this tentative conclusion. We also seek comment on whether there are any other factors that we should consider in specifying criteria related to orbits under this streamlined process.

Operational Debris and Collision Risk. Under our current rules, we require part 25 applicants to state that the satellite operator has assessed and limited the amount of debris released in a planned manner during normal operations. Because the release of operational debris may require closer scrutiny and be inconsistent with a streamlined process, we tentatively conclude that the streamlined process should be limited to satellites that release no operational debris in a planned manner during their mission lifetime. As the release of operational debris is extremely rare among all FCC-licensed satellites, including small satellites, we do not consider this limit as unduly constraining on the availability of the streamlined process. We therefore propose that small satellite applicants must certify that their satellite(s) will release no operational debris, and we seek comment on this proposal. Under current part 25 requirements, applicants must also include a statement that the satellite operator has assessed and limited the probability of accidental explosions, including those resulting from conversion of energy sources on board the spacecraft into energy that fragments the spacecraft. We propose to retain this requirement for the streamlined process in the form of a certification of compliance. We seek

²⁴ For example, NASA has found that recent improvements in the efficiency of electric propulsion systems and miniaturization of chemical propulsion systems have opened the door to small satellites with significantly greater maneuverability than was previously possible.

comment on whether a simple statement to this effect is appropriate, or whether there may be circumstances in which a more detailed disclosure and review is appropriate, for example for spacecraft that have propulsion systems or pressure vessels. Regarding risk of collision, we propose that applicants certify that the probability of each satellite's risk of collision with large objects is less than 0.001, which is consistent with technical guidance developed by NASA for its space missions. We seek comment on whether the 0.001 metric is appropriate for satellites licensed in accordance with the streamlined process, or if a more stringent standard for collision risk may be appropriate, given that multiple satellites that may be deployed. We further inquire into whether an applicant's certification will be sufficient to address collision risk and debris issues, or whether we should seek additional information from satellite applicants under the streamlined process and if so what types of information would be necessary. Alternatively, we ask whether such a certification is necessary given the other eligibility criteria for the streamlined process, such as limiting orbital altitude or requiring propulsion capability.

Trackability. We propose that all applicants seeking to be licensed under the streamlined small satellite process also certify that their satellites will be no smaller than 10 cm x 10 cm x 10 cm to ensure that the satellite will be trackable as a space object.²⁵ This size is consistent with the CubeSat specification. We note that while there may be methods for improving tracking of smaller objects, such as reflectors or transponders, these methods may require closer scrutiny and detailed analysis, and such analysis may be inconsistent with a streamlined process. We further propose that the applicant would also be required to certify that

²⁵ See Space-track.org, Documentation – Frequently Asked Questions, <https://www.space-track.org/documentation#/faq>, (“10 centimeter diameter” or ‘softball size’ is the typical minimum size object that current sensors can track and the JSpoC maintains in the catalog). In an ex parte filing, Alba Orbital stated that satellites with a size under a 10 cm cube can be tracked and asked that satellites with a size of 5 cm or greater be included in the streamlined process. See Alba Orbital, ex parte filing, IB Docket No. 18-86 (filed Apr. 2, 2018).

the satellite will include a unique telemetry marker allowing it to be readily distinguished from other satellites or space objects. We believe these certifications will help ensure that satellite operators will be able to assist entities that track space objects to more easily identify and distinguish between the small satellites utilizing the streamlined process and other space objects. We seek comment on these proposals.

Casualty Risk. We propose that applicants certify that their satellite(s) will be disposed of through atmospheric re-entry following completion of the mission. Under our current satellite authorization rules, including those that apply to experimental and amateur missions, applicants planning disposal of satellites through atmospheric re-entry must provide a statement assessing casualty risk, with an estimate of whether portions of the spacecraft will survive re-entry and reach the surface of the Earth, as well as an estimate of the resulting probability of human casualty. If a statement indicates a risk of human casualty, the spacecraft could result in a future claim being presented to the United States under the relevant United Nations Outer Space Treaties. In light of the casualty risk, it may be necessary to consider satellite modifications that could reduce the risk to zero, or insurance and liability arrangements. We tentatively conclude that consideration of such arrangements, which is likely to involve detailed factual inquiry and potentially complicated legal and financial arrangements, is not consistent with the proposed streamlined process. Therefore, we propose that any small satellite applicant seeking to file under the streamlined process certify that it has conducted a casualty risk assessment using the NASA Debris Assessment Software (DAS) or another higher fidelity model, and that the assessment resulted in a human casualty risk of zero. We seek comment on this proposal.

Cessation of Emissions. ITU Radio Regulation No. 22.1 requires that space stations be fitted with devices to ensure immediate cessation of their radio emissions by telecommand, whenever such cessation is required under the radio regulations. Section 25.207 of the Commission's rules requires that space stations be capable of ceasing radio emissions by the use of appropriate devices (battery life, timing devices, ground command, etc.) that will ensure definite cessation of emissions.²⁶ For the small satellite streamlined process, we propose that small satellites have the ability to cease transmissions by way of command (rather than by other potential means), to ensure the reliability of the satellite's ability to cease transmissions instantaneously. We propose that the applicant would need to certify that the satellite has the ability to receive command signals and cease transmissions as a result of a command. We seek comment on this approach. As part of this approach, we seek comment on whether we should require that satellites employ a "passively safe" system, i.e., the satellite cannot transmit unless it is actively commanded to transmit via a command, and will cease transmission unless within view of a ground station.²⁷

Small Satellite Application Processing. Under the Commission's current regulatory approach, decisions on NGSO-like satellite applications are made using processing round procedures. The Commission adopted this approach for NGSO-like satellite systems because of the possibility of otherwise unreasonably limiting additional market entry if licenses were granted on a first-come, first-served basis. For NGSO-like satellite systems, the Commission had envisioned that grant to one satellite system operator to provide service in a particular

²⁶ 47 CFR 25.207. While section 25.207 applies to part 25 licensees, a similar requirement applies to experimental licensees under part 5 of the Commission's rule. See 47 CFR 5.107 (requiring that licensee maintain control of the transmitter authorized under its license, including the ability to terminate transmissions in the event of interference).

²⁷ See ITU-R SA.2312-0 at 7 (describing a passively-safe system whereby the satellite is actively commanded to transmit only when in view of an associated earth station).

frequency band segment would preclude other satellite system operators from providing service in that frequency band.

The Commission has granted several waivers of the processing round rules for NGSO satellites, including small satellites, operating in the EESS. For these small satellites, the Commission has relied on the applicants' demonstrations that they can avoid interference events through means such as scheduling of transmissions, and would not preclude future entrants from using the same spectrum. For example, where a satellite operates with a limited number of earth stations for purposes of downlinking sensor data during relatively short periods of time, it may be possible for such a satellite system to accommodate future entrants utilizing the same frequency bands. The spectrum demands of such systems differ substantially from the requirements for full-time system availability that characterize the NGSO-like systems provided for by the processing round rule.

We propose that applications qualifying for the streamlined small satellite process be exempt from processing round procedures. Instead, each applicant under the streamlined small satellite process would be required to (a) certify that operations of its satellite will not interfere with those of existing operators, (b) certify that it will not unreasonably preclude future operators from utilizing the assigned frequency band(s), and (c) provide a brief narrative description illustrating the methods by which future operators will not be unreasonably precluded. Such methods could include the sharing of ephemeris data to avoid RF interference events,²⁸ use of directional antennas, limiting operations to certain times throughout the day, limiting earth stations operating with the system to certain defined geographic locations, or some combination of these and other means that could be used to accommodate sharing in the assigned frequency

²⁸ Ephemeris data give the orbital parameters of satellites at different times. In the NGSO FSS R&O, the Commission extended the existing requirement regarding the maintenance of ephemeris data in section 25.271(e) of the Commission's rules to NGSO FSS operations generally.

band(s). Regardless of the methods used, the Commission would make an assessment of the description provided to ensure that operators do not preclude others from operating in the band and thereby limit the risk of spectrum warehousing by licensees. This approach also differs from the first-come, first-served queue used for GSO-like satellites, in that an earlier filed and granted application would not provide a basis for dismissing a later-filed request. We seek comment on this proposal. Applications would be processed in accordance with our existing procedures in other respects.²⁹ We also seek comment on the certification and description requirements, and on the appropriate indicia for sharing.

Although there would be no processing round under our proposed licensing approach, small satellite operators licensed pursuant to the streamlined process would still typically receive interference protections in accordance with the relevant service allocation in the U.S. Table of Allocations. For example, small satellite applicants seeking to operate EESS systems in frequency bands with a secondary EESS allocation will be authorized on a secondary basis. In bands where part 25 licensees are authorized pursuant to a processing round, however, the Commission anticipates that small satellites authorized on a streamlined basis would be subject to some limitations on a frequency-band specific basis, including, in appropriate circumstances, that operations are on a non-interference, unprotected basis with respect to those part 25 systems. We seek comment on this proposed approach to interference protection.

For typical NGSO FSS, MSS, or other operations requiring full-time uninterrupted availability of assigned spectrum, the ability to share spectrum with all existing and future operations is more limited or nonexistent because of the complexities of these systems. We tentatively conclude that the required indicia of sharing would not be present in these instances, and that such operations are more appropriately addressed for authorization under existing part

²⁹ See, e.g., 47 CFR 25.112, 25.151 (acceptability for filing and public notice procedures).

25 procedures, including processing rounds. We recognize, however, that not all FSS and MSS operations require full time spectrum availability. In these instances, where the other criteria are satisfied, authorization under the proposed streamlined small satellite process might be appropriate. We seek comment on these tentative conclusions. In determining whether an application is acceptable for filing within the streamlined small satellite process, we propose to rely on the applicant's certification that it can reasonably share with existing and future operators, as described above, in addition to the other criteria we set forth in this NPRM. We propose to subsequently evaluate the applicant's narrative description of sharing methods, however, particularly in the event that any comments or other pleadings address the applicant's ability to share with other operators. Under such an approach, we would dismiss an application without prejudice if we find that the applicant has failed to demonstrate that the proposed operations will not unduly limit other operations in the band. In such case, the applicant could refile the application as an NGSO-like application in accordance with the requirements of the Commission's processing round procedures. We seek comment on this approach. Aside from the sharing certification and procedures discussed above, we ask whether additional mechanisms would be necessary to prevent authorized small satellite operations in a particular frequency band from having an aggregate interference footprint that is inconsistent with use by other existing or planned services.

Consistent with the above tentative conclusion that small satellites will not preclude others from operating in the band, we further propose to exempt small satellites from the limitations on unbuilt NGSO-like systems contained in section 25.159 of the Commission's rules.³⁰ We seek comment on this proposal.

³⁰ 47 CFR 25.159(b). This rule states that if applicants with an application for one NGSO-like satellite system license on file with the Commission in a particular frequency band, or one licensed-but-unbuilt NGSO-like satellite

Application Requirements. We propose that the FCC Form 312 and Schedule S would continue to serve as the basis for applications under the streamlined small satellite process.³¹ These forms include basic legal and technical information that provides Commission staff with information about the proposed operations.³²

In lieu of the narrative demonstrations required by the existing part 25 rules, we propose that applicants may instead provide the various certifications described above as the qualifying criteria for the streamlined small satellite process.³³ The certifications should ease the burden on applicants of completing a part 25 application. Applicants under the proposed streamlined small satellite process would still need to provide some information in narrative form, such as how their operations will not preclude future operators in the assigned bands, but we do not envision that these additional narrative requirements will be unduly burdensome or undermine the objectives of this NPRM. We seek comment on the proposed changes. We also seek comment on whether there are additional application requirements or revisions to application requirements that should be considered for the streamlined small satellite process.

Revised Bond Requirement. Under the Commission's part 25 rules, most NGSO licensees or recipients of market access must have on file a surety bond. A bond of \$1 million must be filed at 30 days following grant and the amount of the bond that must be on file steadily escalates, with the maximum bond being \$5 million. The surety bond requires payment in the event that the licensee either fails to meet certain milestones, or surrenders the license before

system in a particular frequency band, will not be permitted to apply for another NGSO-like satellite system license in that frequency band.

³¹ The FCC Form 312, Main Form and Schedule S form the foundation for all space station license authorizations. See 47 CFR 25.114(a).

³² The Schedule S software is available electronically on the Commission's website. See FCC Schedule S System, <https://enterpriseefiling.fcc.gov/schedules/>. Applicants are advised to use the software when submitting information to ensure that it is appropriately included in IBFS. See FCC, Specific Instructions for Schedule S (April 2016), <https://enterpriseefiling.fcc.gov/schedules/resources/Instructions%20for%20Schedule%20S%20vApr2016.pdf>.

³³ This certification would be somewhat analogous in form to the Commission's rules on the relocation of GSO space stations. See 47 CFR 25.118(e)(5).

meeting certain milestones for the operation of its system, specifically, launching 50 percent of the maximum number of satellites authorized for service, placing them in their assigned orbits, and operating them in accordance with the station authorization no later than six years after the grant of the authorization.³⁴ Once the Commission determines that the milestone has been satisfied, the authorized entity will be relieved of its bond obligation. The Commission established these requirements to deter warehousing by satellite operators before a proposed satellite has been launched and begun operations and to deter speculative satellite applications.³⁵

We propose a change to the bond requirement normally applicable to NGSO satellites authorized under part 25. Specifically, we propose a one-year “grace period” during which small satellites that qualify for the streamlined process as outlined in this NPRM would not have to post a bond. This grace period would begin 30 days after the license is granted, since that is typically when a licensee must post a bond. We seek comment generally on this proposal.

This grace period may be warranted for two reasons. First, most small satellite operators have a comparatively short window between filing of their application and deployment of their satellites. Applicants for small satellite short-duration missions frequently deploy and begin operations with their satellites within one year or less of obtaining a Commission license. In these instances, once satellites are authorized, there is little opportunity for the applicant to warehouse spectrum that it does not intend to use. Second, as described above, we propose that the estimated on-orbit lifetime of the individual satellites that may be authorized will be five years or less, and that licenses granted under the streamlined process may not be renewed or

³⁴ 47 CFR 25.164(b)(1). There is also a nine-year build out milestone for NGSO systems, requiring that the licensee or market access recipient have its full system launched and operational by nine years after grant or accept a reduction in its authorized satellites to the number launched and operational at that time, but this milestone is not tied to the surety bond. Because we propose a five year on-orbit lifetime, we do not believe this milestone would be relevant for small satellites authorized under the streamlined process. Id. at 25.164(b)(2).

³⁵ Warehousing occurs when an entity holds exclusive authorization or priority for spectrum use or an orbital position, but is unable or unwilling to deploy its authorized satellite system in a timely manner.

extended. Thus, to the extent that the satellite is authorized to operate in a particular frequency band, the licensee is unlikely to preclude the availability of resources to competitors or discourage innovation during this short amount of time. Furthermore, the limitations we propose to place on the applicant's license term, including the start of the five-year license term at launch of the first satellite, discussed *supra*, support this approach as well. We seek comment on these rationales for postponing the bond requirements for small satellites that could be authorized under the streamlined small satellite process proposed in this NPRM. Are there any other considerations that the Commission should take into account when establishing the grace period?

Following the one-year grace period, if the authorized satellite(s) have not yet been deployed, we propose that operators could still launch and operate their satellites subject to the bond and milestone requirements applicable to NGSO satellites, provided that the satellite(s) can still meet the criteria for the small satellite process, including deorbit within the five-year license term (which we have proposed would begin when the first satellite is placed into its authorized orbit). Under this proposal, the escalating bond would need to be filed with the Commission, at the amount that would be applicable for a part 25 NGSO satellite one year after the license has been issued. We seek comment on this approach, and ask whether alternatively we should develop a different bond amount or a more or less rigorous approach to milestones for satellites licensed under the streamlined small satellite process.

In addition, we propose that grantees failing to begin operations during the one-year grace period, because of launch delays, for example, may surrender their license to avoid the bond requirement. Further, we suggest that grantees launching and operating one or more satellites within the one-year grace period, but failing to launch and operate 50 percent of their authorized satellites within that period, may choose to either be subject to the standard NGSO

bond and milestone requirements or, in the case of licenses that specify multiple satellites, accept an automatic reduction in the number of authorized satellites to the number actually in orbit as of the close of the grace period. This proposal would not preclude the filing of a new application for additional satellites. We seek comment on these suggested outcomes.

Technical Rules. Our part 25 rules contain technical requirements governing the operations of both satellites and earth stations. These rules specify, among other things, out-of-band emission limits, frequency tolerances, and power limits.³⁶ We propose that existing generally applicable technical rules in part 25 also be applicable to small satellites authorized under the streamlined process. We seek comment on this proposal. In addition, we note that many of the part 25 technical rules such as out-of-band emission and power limits are in place to avoid interference occurring to other stations. The interference environment in which a small satellite will operate will be a function of the frequency band in which it operates. Consequently, we recognize that the technical requirements for small satellites may need to be adjusted for the different bands and we seek comment on some additional technical requirements later in this NPRM in connection with the discussion of small satellite operations in particular frequency bands.³⁷

Frequency Considerations for Small Satellites.

In this section, we address a number of issues relevant to frequency selection for small satellite systems generally having the characteristics described above.³⁸

³⁶ See, e.g., 47 CFR 25.202(d),(e),(f), 25.204.

³⁷ See, e.g., infra (discussion of possible service rules, including out-of-band emission limits, related to small satellite operations in the 1610.6-1613.8 MHz band).

³⁸ Consistent with a resolution adopted at WRC-15, the ITU-R is currently studying the spectrum requirements for TT&C for NGSO satellites with short duration missions, assessing the suitability of existing international allocations to the space operation service below 1 GHz, and may consider possible new allocations or an upgrade of the existing allocations to the space operation service within the frequency ranges 150.05-174 MHz and 400.15-420 MHz. ITU WRC-15, Resolution 659. See WRC-15 Final Acts, Resolution COM6/19 (WRC-15), available at

Scope of Frequency Use. We seek comment on the specific frequency use characteristics of small satellites that would be authorized under the proposed small satellite process. With respect to bands that are currently shared among services, we do not expect that small satellite operations would displace existing or planned non-satellite operations in a given frequency band. We seek comment on whether small satellites should be required to make any additional demonstrations, either for all bands or in specific bands, about their ability to share with non-satellite services. This could include, for example, demonstrating the ability to avoid interfering with incumbent non-satellite operators. We also seek comment on whether small satellites authorized under the streamlined process should be required to protect other services and accept interference from other services in all instances where they are operating in frequency bands that are shared with non-satellite services. Alternatively, we seek comment on whether these small satellites should be afforded interference protection that is consistent with the relevant satellite allocation in a particular frequency band (e.g., primary or secondary with respect to other allocated services).

The current part 25 rules include a list of frequency bands available for particular types of services, but indicate that operations can be authorized in other bands allocated for satellite services. In order to assist small satellite operators in identifying possible frequency bands for use, we seek comment on including a non-exclusive list of frequencies in section 25.202 of the Commission's rules. We seek comment on the types of bands that should be specified in any such rule. We also seek comment on an alternative proposal to omit a specific list and consider applications on a case-by-case basis, bearing in mind the relevant frequency allocations. As a third alternative, we seek comment on whether the proposed process should be limited to specific

<http://www.itu.int/pub/R-ACT-WRC.12-2015/en>. While we recognize these ongoing efforts at the ITU, we do not limit our consideration to bands identified in the WRC-15 resolution, or to the space operation service.

frequency bands. We also seek comment on the type and quantity of spectrum that will be needed for small satellites to operate. Commenters should include data, analysis, and engineering studies on the expected demand for small satellites. We request that commenters address their need to access specific bands, bearing in mind the case of bands that have other allocations and services.

In addition to the sharing characteristics described above, we anticipate that the actual amount of spectrum used by any particular small satellite will be small, generally no more than a few megahertz and in some cases only a few tens-of-kilohertz, and RF output power will be low. Notably, the ITU has found that for a short duration missions (three years or less) operating on frequencies below 1 GHz, a typical small satellite space segment mission uses a bandwidth of less than 100 kilohertz, a non-directional type antenna with a gain under 3 dBi, and RF output power of 1 W. For small satellites operating on frequencies between 1 and 3 GHz, the ITU found generally a wider bandwidth of less than 7.5 megahertz is used, with non-directional antennae gain under 10 dBi, and an RF output power of less than 1 W. These technical characteristics, such as low power and low bandwidth, are generally consistent with the small satellites granted experimental licenses by the Commission, and are also consistent with the type of operations we envision being authorized pursuant to the streamlined small satellite process described in this NPRM. We understand that in some instances other uses may be anticipated, for example, where data downlinks require larger bandwidths, and so we also seek comment on whether modifications to the proposals discussed in this section would need to be made to accommodate these other types of operations. We also seek comment on the extent to which larger bandwidth transmissions could be conducted via inter-satellite links or alternatives such as optical links.

In the discussion above, we sought comment on whether the existing part 25 technical rules should apply to small satellites. Here we also ask whether particular service rules, on a band-specific basis, may be needed to ensure protection of incumbent users. For example, geographic isolation of small satellite earth stations, power level restrictions on transmissions to and from small satellites, temporal restrictions on small satellite communications with earth stations, antenna specifications or other limitations on satellite design parameters, and/or other technical requirements may enable protection of incumbent operations, depending on the RF environment in each band.

Compatibility and Sharing with Federal Users. The U.S. Table is divided into the Federal Table of Frequency Allocations and the non-Federal Table of Frequency Allocations. Some bands are allocated to both Federal and non-Federal uses. In addition, some footnotes to the U.S. Table specify that use of a particular band by non-Federal users is subject to successful coordination with Federal users. An established set of procedures guides the interaction between the FCC and NTIA in developing regulations for services in shared bands, and for authorizing frequency use by Federal agencies and Commission licensees.³⁹ Under the Memorandum of Understanding (MOU) between NTIA and the Commission, the Commission and NTIA give notice to each other of “all proposed actions that could potentially cause interference” to non-Federal and Federal operations, respectively.”

In discussing the compatibility of small satellites with other operations, however, we note that a number of the frequency bands where small satellites have been authorized, and where there are non-Federal allocations for services such as EESS and space operations,⁴⁰ are shared with Federal users. Small satellite operations in these bands must be compatible with Federal

³⁹ For example, the NTIA Manual describes technical requirements for Federal radio services.

⁴⁰ The space operation service is a radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand.

uses. We seek comment on any rules that could be adopted by the Commission specific to these frequency bands that would better enable small satellite operators to consider, in advance of coordination, whether they may be able to operate in these bands while still protecting Federal operations. Examples of such rules could include traditional approaches requiring geographic isolation of non-Federal earth stations from Federal earth stations or other sites, or approaches such as permitting a satellite to transmit only when it is receiving uplink communications from certain pre-coordinated earth station sites.⁴¹ These examples would not necessarily replace the need to coordinate with Federal systems on a case-by-case basis, but we seek comment on whether these approaches or cooperative arrangements, public-private partnerships, scientific research programs, or other hybrid Federal/non-Federal arrangements could help streamline sharing. How would the establishment of certain service rules or other requirements on a band-specific basis help to facilitate compatibility among separate systems and development of new types of shared and efficient uses of space and spectrum resources? We seek comment on these issues and on whether and how such rules and requirements may vary depending on the specific frequency bands being considered.

Small Satellite Operations as an Application of the MSS. We believe that it may be appropriate to permit small satellite operations in selected bands allocated to the MSS, where the characteristics of the small satellite operations, as described in this NPRM, would limit any potential for interference into existing MSS operations, and would ensure that the small satellite operations would have less potential for interference to either in-band or adjacent band services than operations that would typically be considered in the MSS. As discussed infra, this proposal corresponds to allocations to the MSS (Earth-to-space) in the 149.9-150.05 MHz and 1610.6-

⁴¹ This approach could be consistent with our proposal that small satellites authorized under the streamlined process have implemented a passively-safe system whereby the satellite is actively commanded to transmit by command originating from the ground.

1613.8 MHz frequency bands. Accordingly, in these specific instances, our proposal would be to add a use footnote to the U.S. Table stating that small satellites authorized under the new process in section 25.122 of the Commission's rules may be considered an application of the MSS. In connection with this proposal, we seek comment on whether such operations should in all cases be on a non-interference, unprotected basis, or whether the operations may have status in the frequency band, provided that the satellites operate consistent with any limitations on the MSS allocations and have demonstrated compliance with the small satellite process in section 25.122.

Discussion of New Small Satellite Operations in Select Bands

In this section, we highlight frequency bands with existing non-Federal frequency allocations for space operations or other satellite services (e.g., MSS) in the U.S. Table that we believe may accommodate small satellite operations in addition to the services that have been authorized in the frequency bands to date. For the frequency bands under consideration, we seek comment on potential service rules or limitations that could be placed on operations in these bands in order to better facilitate coordination and sharing with incumbent operations. In some instances, we also seek comment on proposing additional service allocations.

137-138 MHz and 148-150.05 MHz. The 137-138 MHz band is allocated for downlinks in Federal and non-Federal portions of the U.S. Table on a co-primary basis to the space operation service (space-to-Earth), meteorological satellite service (space-to-Earth), and the space research service (space-to-Earth). Several sub-bands within the 137-138 MHz band are also allocated to the MSS (space-to-Earth), either on a co-primary or secondary basis, in the Federal and non-Federal Tables, but are limited to non-voice, non-geostationary (NVNG) satellite systems.⁴² The 148-150.05 MHz band is allocated for uplinks to the MSS (Earth-to-

⁴² MSS operations in the 137-138 MHz band are also subject to coordination under ITU R.R. No. 9.11A. Under the Commission's rules, stations of a secondary service shall not cause harmful interference to and cannot claim

space) on a primary basis in the Federal and non-Federal Tables, also limited to NVNG satellite systems.⁴³ The 148-149.9 MHz frequency band is also allocated by footnote to the space operation service (Earth-to-space) on a co-primary basis in the Federal and non-Federal Tables, subject to agreement obtained under No. 9.21 of the ITU Radio Regulations, limited to bandwidths not exceeding 25 kilohertz for any individual transmission, and to the fixed service (FS) and mobile service (MS) on a co-primary basis for Federal use. The 149.9-150.05 MHz band is also allocated to the radionavigation-satellite service (RNSS) on a co-primary basis in the Federal and non-Federal Tables. Under an international footnote, MSS operations in the 149.9-150.05 MHz band must be coordinated under No. 9.11A of the ITU R.R., and use of the band by the MSS shall not constrain the development and use of the band by the radionavigation satellite-service.

The 137-138 MHz and 148-150.05 MHz bands were the subject of a processing round and rulemaking in 1997 and 1998, which resulted in the grant of several licenses for the provision of MSS in these bands. Of the initial licensees, only one, ORBCOMM License Corp. (ORBCOMM), remains licensed to provide commercial NVNG MSS in the 137-138 MHz or 148-150.05 MHz bands. In 2008, ORBCOMM was granted a modification of its license for an NVNG MSS system to construct, launch, and operate additional satellites capable of operating in the 137-138 MHz and 148-150.05 MHz frequency bands. ORBCOMM subsequently received another modification of its license in 2016.⁴⁴ Considering all the various modifications to its

protection from harmful interference from stations of primary service to which frequencies are already assigned or to which frequencies may be assigned at a later date, but can claim protection from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

⁴³ MSS operations in the 148-149.9 MHz band must be coordinated under No. 9.11A of the ITU R.R., and the use of the band by the MSS shall not constrain the use and development of the band by the fixed, mobile, and space operation services.

⁴⁴ In addition to a discrete set of frequency bands granted to ORBCOMM for use on a primary basis in 2008, ORBCOMM was subsequently granted authorization for a 50 kilohertz downlink centered at 137.4 MHz and a feeder link centered at 150.025 MHz.

license, ORBCOMM is specifically authorized to operate in certain sub-bands. ORBCOMM was also granted authority to operate throughout the 137-138 MHz and 148-150.05 MHz frequency bands until commencement of operations by another U.S.-licensed NVNG MSS system, consistent with the spectrum sharing plan adopted by the Commission in a 1997 order establishing rules and policies for the licensing and operation of satellite systems in the NVNG MSS.⁴⁵ To date, no other NVNG MSS systems have operated in these frequency bands, although a handful of experimental small satellites have proposed operations in these frequency bands.

In light of the existing frequency allocation for space operation downlinks in the 137-138 MHz band, and the allocation for space operation uplinks the 148-149.9 MHz band in accordance with international footnote 5.218, we seek comment on use of these bands for small satellite operations. Additionally, we propose to permit small satellite uplinks in the 149.9-150.05 MHz frequency band as an application of the MSS. The ORBCOMM system is currently operating in portions, if not all, of these frequency bands. As these frequency bands were originally considered for use by multiple satellite systems, we request comment generally on whether, and if so, how, small satellite space operations could share this spectrum while protecting ORBCOMM's existing and future MSS operations. As part of this proposal, we consider whether small satellites could utilize spectrum in those frequency bands where ORBCOMM has been authorized to operate pending commencement of operations by another U.S.-licensed NVNG MSS system (i.e., the individual sub-bands within the 137-138 MHz and

⁴⁵ The Little LEO satellite service uses constellations of low-earth orbiting (LEO) satellites to provide commercial radiolocation and two-way data messaging services. Operating at altitudes much lower than those in geostationary orbits, Little LEO satellites are typically deployed in constellations so that as one satellite moves out of view of a terrestrial station, another satellite will come over the horizon to maintain coverage.

148-150.05 MHz frequency bands that were not specifically identified in ORBCOMM’s license or subsequent modifications to its license). We seek comment on this proposal.

In addition, we note the additional requirements applicable to these frequency bands. We note that operations in the downlink band, 137-138 MHz, in the MSS are subject to a number of service rules to effectuate coordination with NOAA. We seek comment on whether any of these service rules should be similarly applied to potential operations by small satellites in this frequency band. The uplink band, 148-150.05 MHz, is subject to coordination, to the extent specified in the U.S. Table and/or International Table, under Nos. 9.11A and 9.21 of the ITU Radio Regulations.⁴⁶ We seek comment on whether these coordination requirements will significantly impede use of this band by small satellites for short duration missions.⁴⁷

1610.6-1613.8 MHz. The 1610.6-1613.8 MHz frequency band is allocated for Federal and non-Federal use on a co-primary basis to the MSS (Earth-to-space), the aeronautical radionavigation service, the radiodetermination-satellite service (Earth-to-space), and the radio astronomy service (RAS) on a co-primary basis. This band is part of what is known as the “Big LEO” spectrum.⁴⁸ In the United States, the 1610-1626.5 MHz frequency band is currently divided between the time division multiple access (TDMA) MSS system operated by Iridium Constellation LLC (Iridium) with service links in both directions and the code division multiple access (CDMA) MSS system operated by Globalstar Inc. (Globalstar). Currently, Globalstar is

⁴⁶ As noted, MSS operations in the 148-149.9 MHz band are subject to coordination under No. 9.11A of the ITU R.R., 47 CFR 2.106, international footnote 5.219, and pursuant to an international footnote, MSS operations in the 149.9-150.05 MHz band are subject to coordination under No. 9.11A of the ITU R.R., 47 CFR 2.106, international footnote 5.220 (not in U.S. Table). Stations operating in the space operation service in the 148-149.9 MHz band are subject to agreement obtained under No. 9.21 of the ITU R.R., 47 CFR 2.106, international footnote 5.218.

⁴⁷ See ITU R.R. No. 9.21. We note that in Resolution 659 (WRC-15) relating to suitable allocations for the space operation service for short duration missions, as discussed *infra*, the ITU-R recognized that allocations where No. 9.21 applies are not suitable for use by short duration missions.

⁴⁸ The Commission has previously classified some satellites operating in LEO as Big LEOs or Little LEOs. Big LEOs provide voice and data communications above 1 GHz, while Little LEOs provide data communications below 1 GHz.

authorized to operate at 1610-1617.775 MHz on an exclusive basis. In accordance with the non-Federal portion of the U.S. Table, the lower portion of the spectrum, at 1610.6-1613.8 MHz is also used by RAS receivers. Globalstar's operations in this band must protect RAS sites in the United States.

We seek comment on whether small satellites could operate in this band as an application of the MSS under the existing uplink allocation. These would be small satellite Earth-to-space links operating independently of the Globalstar system.⁴⁹ We tentatively conclude that this band offers spectrum for small satellites to use, provided that the small satellite uplink operations can protect the existing MSS operations, as well as RAS operations. To these ends, we believe that service rules would be appropriately applied to any small satellites seeking to operate in these bands as an application of the MSS. We seek comment on what service rules would be necessary to protect MSS and RAS operations. For example, small satellites seeking to operate in this band could demonstrate that they are not within certain exclusion zones related to United States RAS sites, such as those identified in section 25.213. Earth stations transmitting in these bands for any system could be limited in number and be specifically identified in the application materials for applicants seeking to operate in this band. Small satellite operations in the band could be required to observe out of band emissions limits in section 25.216 to protect the radionavigation satellite service (RNSS). Moreover, we could require that all earth stations operating with a small satellite system have directional antennas and that the system must have the ability to avoid in-line interference events to the existing operators in the band, primarily through operations at higher latitudes. We seek comment on these proposals. We also seek comment on whether authorization should be limited to communications with U.S. earth stations or if other limitations should be adopted. We seek further comment on the potential impact of

⁴⁹ Operations of small satellites using the Globalstar system are addressed infra.

small satellite operations in this band to existing or planned operations in adjacent or nearby bands, including to Iridium's operations in the adjacent band above,⁵⁰ and to RNSS systems operating below 1610 MHz. We seek comment on whether application of the existing out of band emissions limits in section 25.216 of the Commission's rules would be sufficient to protect these systems from harmful interference.

Use of MSS and FSS Frequency Bands for Inter-Satellite Links with Small Satellites.

The Commission's rules and the ITU Radio Regulations define "inter-satellite service" as a radiocommunication service providing links between satellites. Section 25.279(a) of the Commission's rules states that space stations may use frequencies in the inter-satellite service as indicated in section 2.106, and other frequencies where inter-satellite links are part of the service definition. For example, the definition of FSS states that in some cases FSS may include satellite-to-satellite links, which may also be operated in the inter-satellite service. The definition of MSS likewise includes radiocommunication service "between space stations used by this service," thereby permitting frequencies allocated to MSS to be used for inter-satellite links. For service allocations in some frequency bands, the Table of Frequency Allocations specifies a directional limitation on operations.⁵¹ For example, an allocation for FSS may be limited by parenthetical to the space-to-Earth direction. In that instance, inter-satellite communications would not be in accordance with the Table of Allocations.⁵² Where a parenthetical to the FSS allocation specified "space-to-space" communications, the operation of inter-satellite links would be in accordance with the allocation, subject to any other limitations.

⁵⁰ Iridium and Globalstar share 0.95 megahertz of spectrum at 1617.775-1618.725 MHz. Iridium has an exclusive assignment of MSS spectrum in the 1618.725-1626.5 MHz band.

⁵¹ ITU R.R. No. 5.49 ("In the case where there is a parenthetical addition to an allocation in the Table, that service allocation is restricted to the type of operation so indicated.")

⁵² While not in conformance with the International Table, space stations at both ends of the inter-satellite link would still be subject to applicable notification requirements under the Radio Regulations.

In the MSS, Globalstar has operated several experimental inter-satellite links with small satellites. The small satellites use Globalstar equipment developed for earth station operations to transmit and receive data by means of the Globalstar system, including Globalstar satellites and ground infrastructure. The experimental communications have taken place on frequencies currently authorized to Globalstar for MSS, typically in the 1615-1617.75 MHz or 2483.5-2495 MHz bands. Iridium has similarly been authorized on an experimental basis to utilize its MSS satellites to communicate with small satellites equipped with Iridium user terminals in spectrum authorized for use by Iridium, including in the 1618.725-1626.5 MHz band. In filings for experimental authorizations, Iridium and Globalstar acknowledge that their part 25 authorizations currently do not cover these types of space-to-space communications. The frequency bands that have been used for inter-satellite communications between small satellites and the Iridium and Globalstar system do not include an allocation for space-to-space operations in the MSS. Therefore, these operations to date, licensed under the experimental process, have not been in conformance with the Table of Frequency Allocations.

We tentatively conclude that it would serve the public interest to develop an allocation for space-to-space operations in the MSS in the frequency bands that have been used for communications with the Globalstar and Iridium systems. There are a number of benefits to inter-satellite operations, given the capabilities and existing infrastructure of these MSS systems and the ability of small satellite operators to obtain components needed to communicate with these systems. We believe that encouraging relay operations using Iridium, Globalstar, or other systems can alleviate some of the difficulties faced by small satellite operators in identifying frequencies for Earth-to-space and space-to-Earth links and building or seeking out ground station infrastructure. We seek comment on these tentative conclusions. In addition, given the

interest in similar relay communications with satellites operating in the FSS, we ask whether there are other frequency bands that may be appropriate to identify for facilitating inter-satellite communications between satellites operating in the FSS and small satellites. Alternatively, we ask whether there is a definitional change we could develop and propose for MSS, FSS, or ISS that would enable broader change at the ITU for future accommodation of these services within existing allocations. We also seek comment on whether there are additional requirements, for example, technical requirements, that could be adopted to facilitate the use of MSS or FSS frequency bands for inter-satellite links without creating potential interference to other operations.

Additionally, we seek comment on providing for the authorization of inter-satellite service links in the frequency bands that have been used for communications with the Globalstar and Iridium systems through a footnote to the U.S. Table. We also seek comment on the bands within the MSS allocations currently used by Globalstar and Iridium, such as 1613.8-1626.5 MHz and 2483.5-2495 MHz, that would be appropriate for this proposal. We recognize, for example, that frequency bands such as 1610-1613.8 MHz may not be appropriate for such operations, in order to ensure protection of radio astronomy installations.

Fees. We note two important matters related to our statutory fees.⁵³

Application Fees. With respect to the one-time application processing fee, the Commission's fee schedule is set forth in section 8 of the Act. The fee schedule includes a category for "Low-Earth Orbit Satellite Systems," which the Commission has interpreted to mean NGSO space stations. The Commission's International and Satellite Services Fee Filing

⁵³ Applicants for U.S. market access do not currently incur application or regulatory fees. See, e.g., Procedures for Assessment and Collection of Regulatory Fees, 28 FCC Rcd 7790, 7809, para. 48 (2013) ("Despite the regulatory benefits provided by the Commission to non-U.S. licensed satellite systems serving the United States they do not incur the regulatory fees (or application fees) paid by U.S.-licensed satellite systems.").

Guide describes an NGSO space station as: “NGSO space stations orbit the earth in non-geostationary orbits,” and the associated one-time processing fee for authority to deploy and operate these space stations is \$454,705.00. Because we expect most small satellites would use low-earth orbits, we would expect them to fall into this current application fee category.

Recently, Congress passed the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018, or the RAY BAUM’S Act of 2018, which authorized the Commission to “by rule amend the schedule of application fees . . . so that the schedule reflects the . . . addition of new categories of applications.”⁵⁴ Such application fees should “recover the costs of the Commission to process applications.”⁵⁵ Given our expectation that small satellite applications will take less time and fewer Commission resources to process than a typical NGSO system, we propose to establish a new application fee for small satellite applications well below the application fee of \$454,705 for Low-Earth Orbit Satellite Systems—specifically we estimate a fee of \$30,000 would likely recover the costs to the Commission to process these applications.⁵⁶ We anticipate that processing a small satellite application may require comparable Commission resources to processing an application for a modification of an NGSO system, for which the application fee is currently \$32,480. Modification applications typically do not require review of a full set of data, but only those aspects of the operations that are changing, and frequently do not require a processing round. This more limited review is less resource intensive, and similarly, we expect that review of satellite application filed under the proposed streamlined process would be more limited given the streamlined application and lack of processing rounds. We seek comment on this application-fee proposal, as well as whether a

⁵⁴ Consolidated Appropriations Act, 2018, 115th Cong., Division P, section 102 (amending section 8(c) of the Act).

⁵⁵ *Id.* (amending section 8(a) of the Act).

⁵⁶ We note that the effective date of this statutory change is October 1, 2018, and we make clear that we are not proposing to make any changes to our application fees before that date. *Id.* (section 103 of the Act, effective date).

higher or lower fee would be appropriate. We further seek comment on the costs and benefits of this proposal. We also note that the Commission will be developing an accounting system to track the costs of applications, including small satellite applications,⁵⁷ and we expect that our experience actually processing these new applications will eventually inform the appropriate application fee.

Regulatory Fees. The second fee-related matter concerns annual regulatory fees for small satellites. Entities authorized to operate NGSO systems under part 25 currently must pay an annual regulatory fee which, for fiscal year 2017, was \$135,350.00 per operational system. As a general matter, the Commission does not entertain issues about specific parts of the regulatory fee schedule apart from its annual review of the overall regulatory fee schedule, given the interdependency of the fees charged across individual categories.⁵⁸ Accordingly, any comments regarding regulatory fees, as applicable to small satellites, should be filed in the proceedings we open for conducting the annual review of such fees.⁵⁹

Conclusion

Small satellites represent a dynamic sector in the satellite industry. Our goal is to encourage innovation in this realm by developing processes that can accommodate new types of

⁵⁷ Id. (adding section 9A(f) to the Act).

⁵⁸ The Commission annually reviews the regulatory fee schedule, proposes changes to the schedule to reflect changes in the amount of its appropriation, and proposes increases or decreases to the schedule of regulatory fees. The Commission allocates the total amount to be collected among the various regulatory fee categories. Thus, a change in the regulatory fee schedule applicable to one category may affect the regulatory fees applicable to other categories.

⁵⁹ Academic researchers from the Samuelson-Glushko Technology Law & Policy Clinic filed an ex parte letter stating that absent changes, the annual regulatory fee of \$135,350 currently assessed to NGSO systems would effectively prevent universities seeking to deploy small satellite systems from utilizing the proposed licensing procedures, and asking that we seek comment on the regulatory fee in this NPRM. See Letter from Blake Reid, Director, et. al., Samuelson-Glushko Technology Law & Policy Clinic to Jose Albuquerque, Chief, Satellite Division, International Bureau, FCC, IB Docket No. 18-86 (filed Apr. 9, 2018). Given the interdependency of the fees charged across individual categories, comments regarding regulatory fees should be filed in the proceedings for annual review of those fees, and there are no limitations that would hinder development of the record in those proceedings.

missions while still ensuring that operators do not experience harmful interference and that the operations are in the public interest. Accordingly, we seek comment on these proposals.

Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this NPRM. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines specified in the NPRM for comments. The Commission will send a copy of this NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA). In addition, the NPRM and IRFA (or summaries thereof) will be published in the Federal Register.

A. Need for, and Objectives of, the Proposed Rules.

This NPRM seeks comment on several proposals relating to the Commission's rules and policies related to small satellites. The rules proposed in this NPRM will accommodate authorization under part 25 of the Commission's rules of satellites that until now have been licensed through the experimental licensing process in part 5 of the Commission's rules and have not been able to provide full commercial service, or have been required to file for a regular part 25 NGSO authorization. Adoption of the proposed changes would modify 47 CFR part 25 of the Commission's rules to make small satellite authorization more accessible, limit regulatory costs borne by applicants, shorten application processing times, and offer protection for critical communication links, while promoting efficient use of spectrum.

B. Legal Basis

The proposed action is authorized under sections 4(i), 7, 8, 301, 303, 308 and 309 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 157, 158, 301, 303, 308, 309.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected the proposed rules, if adopted. The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.” In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act. A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

Satellite Telecommunications and All Other Telecommunications

The rules proposed in this NPRM would affect some providers of satellite telecommunications services, if adopted. Satellite telecommunications service providers include satellite and earth station operators. Since 2007, the SBA has recognized two census categories for satellite telecommunications firms: “Satellite Telecommunications” and “All Other Telecommunications.” Under both categories, a business is considered small if it had \$32.5 million or less in average annual receipts.

The first category of Satellite Telecommunications “comprises establishments primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.” For this category,

Census Bureau data for 2012 show that there were a total of 333 satellite telecommunications firms that operated for the entire year. Of this total, 299 firms had annual receipts of under \$25 million, and 12 firms had receipts of \$25 million to \$49,999,999.

The second category of Other Telecommunications is comprised of entities “primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.” For this category, Census Bureau data for 2012 show that there were a total of 1,442 firms that operated for the entire year. Of this total, 1,415 firms had annual receipts of under \$25 million. We anticipate that some of these “Other Telecommunications firms,” which are small entities, are earth station applicants/licensees, but since we do not propose changes to our licensing rules specific to earth station, we do not anticipate that these entities would be affected if our proposed rule changes are adopted.

We anticipate that our proposed rule changes may have an impact on space station applicants and licensees. While traditionally space station applicants and licensees only rarely qualified under the definition of a small entity, the small satellite applicants and licensees that are contemplated by this NPRM may qualify as small entities that would be affected by our proposed actions.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

This NPRM seeks comments and proposed several rule changes that will affect small satellite authorization procedures, recordkeeping, and other compliance requirements for space station operators. Many of the proposed changes, as described below, would decrease the burden in various regards for entities that plan to launch or operate satellites that may be colloquially referred to as “small satellites.”

First, this NPRM proposes to simplify application requirements by tailoring a section specifically for small satellites or small satellite constellations meeting certain characteristics, such as low total number of satellites, short mission duration, and low altitude orbit. These proposals include some documentation requirements consistent with those already established for an applicant under part 25 of the Commission’s rules. We propose that some of the informational requirements, however, may be completed by a certification rather than narrative description, which we believe will lessen the burden on these small satellite applicants.

Second, this NPRM proposes to identify frequencies which may be useful for small satellites. This portion of the NPRM should not increase any requirements with respect to small entities, but instead, is designed to help small entities apply for satellite licenses.

Third, this NPRM proposes to decrease the application fees applicable to small satellites to \$30,000.

In sum, this NPRM seeks to make obtaining authorization of small satellites more accessible, limit regulatory costs borne by applicants, shorten application processing times, and encourage the protection of communications links, while enabling efficient use of spectrum.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rules for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.”

This NPRM seeks comment from all interested parties. The Commission is aware that some of the proposals under consideration may impact small entities. Small entities are encouraged to bring to the Commission’s attention any specific concerns they may have with the proposals outlined in this NPRM.

The Commission expects to consider any economic impact on small entities, as identified in comments filed in response to this NPRM, in reaching its final conclusions and taking action in this proceeding.

In this NPRM, the Commission considers rule revisions to reflect changes and advances in the satellite industry. This NPRM proposes to eliminate some information filing requirements. We propose that applicants may provide certifications in lieu of narrative information. In addition, we propose that applicants be exempt from the bond requirement for a certain period of time, and that applications for small satellites will not be subject to the processing round procedures. These proposals are designed to lower the regulatory burden involved in licensing small satellites and reduce application processing times, thereby lessening

the burden of compliance on small entities with more limited resources than larger entities. Additionally, the NPRM proposes to decrease the application fee for small satellite applicants.

The proposed streamlined process is optional, so a small satellite applicant could still choose to apply under the Commission's existing part 5 or part 25 rules. The proposed changes, however, would facilitate authorization of small satellites under part 25 of the Commission's rules. These changes could support smaller entities who aim to develop and launch a small satellite or a small satellite constellation.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules

None.

List of Subjects

47 CFR Part 2

Radio, Table of Frequency Allocations

47 CFR Part 25

Communications equipment, Earth stations, Radio, Reporting and recordkeeping requirements, Satellites.

FEDERAL COMMUNICATIONS COMMISSION

Marlene Dortch,
Secretary,
Office of the Secretary.

Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 parts 2 and 25 as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;

GENERAL RULES AND REGULATIONS

1. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Amend § 2.106, the Table of Frequency Allocations, under “UNITED STATES (US) FOOTNOTES,” by adding, in numerical order, footnote USXXX to read as follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

USXXX In the bands 149.9-150.05 MHz and 1610.6-1613.8 MHz, small satellites as authorized under 47 CFR 25.122 operate as an application of the mobile-satellite service (Earth-to-space).

* * * * *

PART 25 – SATELLITE COMMUNICATIONS

3. The authority citation for part 25 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721 unless otherwise noted.

4. Amend § 25.113 by revising paragraph (i) to read as follows:

§ 25.113 Station construction, deployment approval, and operation of spare satellites.

* * * * *

(i) An operator of NGSO space stations under a blanket license granted by the Commission, except for those authorized pursuant to the application process in § 25.122, need not apply for license modification to deploy and operate technically identical replacement satellites in an authorized orbit within the term of the system authorization. However, the licensee must notify the Commission of the intended launch at least 30 days in advance and certify that its operation of the additional space station(s) will not increase the number of space stations providing service above the maximum number specified in the license.

5. Amend § 25.114 by revising introductory paragraph (d) to read as follows:

§ 25.114 Applications for space station authorizations.

* * * * *

(d) The following information in narrative form shall be contained in each application, except NGSO space station applications filed pursuant to § 25.122:

* * * * *

6. Amend § 25.117 by revising paragraph (d)(1) to read as follows:

§ 25.117 Modification of station license.

* * * * *

(d)(1) Except as set forth in § 25.118(e) and (f), applications for modifications of space station authorizations shall be filed in accordance with § 25.114 and/or § 25.122, as applicable, but only those items of information listed in § 25.114 and/or § 25.122 that change need to be submitted, provided the applicant certifies that the remaining information has not changed.

* * * * *

7. Amend § 25.121 by revising paragraphs (a)(1) and adding paragraph (a)(3) to read as follows:

§ 25.121 License term and renewals.

(a) * * *

(1) Except for licenses for DBS space stations, SDARS space stations and terrestrial repeaters, 17/24 GHz BSS space stations licensed as broadcast facilities, and licenses for which the application was filed pursuant to § 25.122, licenses for facilities governed by this part will be issued for a period of 15 years.

* * * * *

(3) Licenses for which the application was filed pursuant to § 25.122 will be issued for a period of 5 years, without the possibility of extension or replacement authorization.

* * * * *

8. Add § 25.122 to read as follows:

§ 25.122 Applications for streamlined small satellite authorization.

(a) This Section shall only apply to applicants for NGSO satellite systems that are able to certify compliance with the certifications set forth in paragraph (c) of this section. For applicants seeking to be authorized under this section, a comprehensive proposal for Commission evaluation must be submitted for each satellite in the proposed NGSO satellite system on FCC Form 312, Main Form and Schedule S, as described in § 25.114(a) through (c), together with the certifications described in paragraph (c) of this section and the narrative requirements described in paragraph (d) of this section.

(b) Applications for NGSO satellite systems may be filed under this section, provided that the total number of space stations in the system is ten or fewer.

(1) To the extent that space stations in the satellite system will be technically-identical, the applicant may submit an application for blanket-licensed space stations.

(2) Where the space stations in the satellite system are not technically-identical, the applicant must certify that each type of space station satisfies the criteria in paragraph (c) of this section, and submit technical information for each type of space station.

(c) Certifications under this section. Applicants filing for licenses under the streamlined procedure described in this section must include with their applications certifications that the following criteria will be met for all space stations to be operated under the license:

- (1) The space station(s) will operate only in non-geostationary orbit;
- (2) The total on-orbit lifetime is planned to be five years or less for the system;
- (3) The space station(s):
 - (i) Will be deployed at an orbital altitude of 400 km or below;
 - (ii) Will be deployed from the International Space Station, or a vehicle docked with the International Space Station; or
 - (iii) Will maintain a propulsion system and have the ability to make collision avoidance maneuvers at any time the space station is located above an altitude of 400 km.
- (4) The space station(s) will be identifiable by unique markers distinguishing it from other space stations or space objects;
- (5) The space station(s) will release no operational debris;
- (6) No debris will be generated in an accidental explosion resulting from the conversion of energy sources on board the space station into energy that fragments the spacecraft;
- (7) The probability of a collision between each space station and any other large object during the orbital lifetime of the space station is less than 0.001.

(8) The space station(s) will be disposed of post-mission through atmospheric re-entry. The probability of human casualty from portions of the spacecraft surviving re-entry and reaching the surface of the Earth is zero based on reasonable calculations;

(9) Operation of the space station(s) will not cause harmful interference to space stations currently authorized under this part and operating in the requested frequency band(s) consistent with the U.S. Table of Frequency Allocations. Operations will not unreasonably preclude future entrants from utilizing the requested frequency band(s);

(10) The space station(s) will not transmit unless it receives a command originating from the ground to do so and can be commanded by command originating from the ground to cease transmissions;

(11) Each space station will have physical dimensions greater than 10 cm x 10 cm x 10 cm; and

(12) Each space station will have a mass of 180 kg or less.

(d) Other application information. The following information in narrative form shall be contained in each application:

(1) An overall description of system facilities, operations, and services and an explanation of how uplink frequency bands would be connected to downlink frequency bands;

(2) Public interest considerations in support of grant;

(3) A description of means by which requested spectrum could be shared with both current and future operators, (e.g., how ephemeris data will be shared, antenna design, earth station geographic locations) thereby not unreasonably precluding other operations in the requested frequency band(s);

(4) For space stations with any means of maneuverability, including both active and passive means, a description of the design and operation of maneuverability and de-orbit systems; and

(5) If at the time of application any manned spacecraft is located at or below the deployment orbital altitude of the space station seeking a license, a description of the design and operational strategies that will be used to avoid in-orbit collision with such manned spacecraft.

9. Amend § 25.156 by revising paragraph (d)(1) to read as follows:

§ 25.156 Consideration of applications

* * * * *

(d)(1) Applications for NGSO-like satellite operation will be considered pursuant to the procedures set forth in § 25.157, except as provided in § 25.157(b) or § 25.157(i), as appropriate.

* * * * *

10. Amend § 25.157 by revising paragraph (a), and adding paragraph (i) to read as follows:

§ 25.157 Consideration of applications for NGSO-like satellite operation.

(a) This section specifies the procedures for considering license applications for “NGSO-like” satellite operation, except as provided in paragraphs (b) and (i) of this section. For purposes of this section, the term “NGSO-like satellite operation” means:

(1) Operation of any NGSO satellite system, and

(2) Operation of a GSO MSS satellite to communicate with earth stations with non-directional antennas.

* * * * *

(i) For consideration of license applications filed pursuant to the procedures described in § 25.122, the application will be processed and granted in accordance with §§ 25.150 through 25.156, taking into consideration the information provided by the applicant under § 25.122(d)(3), but without a processing round as described in this section and without a queue as described in § 25.158.

11. Amend § 25.159 revising paragraph (b) to read as follows:

§ 25.159 Limits on pending applications and unbuilt satellite systems.

* * * * *

(b) Applicants with an application for one NGSO-like satellite system license on file with the Commission in a particular frequency band, or one licensed-but-unbuilt NGSO-like satellite system in a particular frequency band, will not be permitted to apply for another NGSO-like satellite system license in that frequency band, except for applicants filing pursuant to § 25.122.

* * * * *

12. Amend § 25.165 by revising paragraphs (a) and (e), and adding paragraph (h) to read as follows:

§ 25.165 Surety bonds.

(a) For all space station licenses issued after September 20, 2004, other than licenses for DBS space stations, SDARS space stations, space stations licensed under the process outlined in section 25.122, and replacement space stations as defined in paragraph (e) of this section, the licensee must post a bond within 30 days of the grant of its license. Failure to post a bond will render the license null and void automatically.

* * * * *

(e) A replacement space station is one that:

- (1) Is authorized to operate at an orbital location within $\pm 0.15^\circ$ of the assigned location of a GSO space station to be replaced or is authorized for NGSO operation and will replace an existing NGSO space station in its authorized orbit, except for space stations authorized under section 25.122;
- (2) Is authorized to operate in the same frequency bands, and with the same coverage area as the space station to be replaced; and
- (3) Is scheduled to be launched so that it will be brought into use at approximately the same time, but no later than, as the existing space station is retired.

* * * * *

(h) Licensees of space stations under the process outlined in § 25.122 need not post a bond unless the space station is not launched, orbiting, and operational, as described in § 25.164, within a period of one year plus 30 days following grant of license. If the space station is not operational following the one year plus 30 days period, then the licensee must file a bond in accordance with paragraph (a)(1) of this Section, and be subject to the requirements of paragraphs (b), (c), and (g) of this section.

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13. Amend § 25.217 by revising paragraph (b)(1) and adding paragraph (b)(4) to read as follows:

§ 25.217 Default service rules.

(b)(1) For all NGSO-like satellite licenses, except as specified in paragraph (b)(4), for which the application was filed pursuant to the procedures set forth in § 25.157 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency

band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§ 25.143(b)(2)(ii) (except NGSO FSS systems) and (iii), 25.204(e), and 25.210(f) and (i).

* * * * *

(4) For all small satellite licensees, for which the application was filed pursuant to § 25.122, authorizing operations in a frequency band for which the Commission has not adopted frequency-band specific service rules at the time the license is granted, the licensee will not be required to comply with the technical requirements specified in this section.

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[FR Doc. 2018-10943 Filed: 5/23/2018 8:45 am; Publication Date: 5/24/2018]